



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification⁶ : D21F 1/00, 7/08</p>	<p>A1</p>	<p>(11) International Publication Number: WO 98/56982</p> <p>(43) International Publication Date: 17 December 1998 (17.12.98)</p>
<p>(21) International Application Number: PCT/GB98/01544</p> <p>(22) International Filing Date: 10 June 1998 (10.06.98)</p> <p>(30) Priority Data: 9712113.1 12 June 1997 (12.06.97) GB</p> <p>(71) Applicant (for all designated States except US): SCAPA GROUP PLC [GB/GB]; Oakfield House, 93 Preston New Road, Blackburn, Lancashire BB2 6AY (GB).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): JEFFERY, John [GB/GB]; 65 Ryoshaw Avenue, Pleckgate, Blackburn, Lancashire BB1 8RJ (GB).</p> <p>(74) Agents: MIDDLEMIST, Ian, Alastair et al.; Wilson Gunn M'Caw, 41-51 Royal Exchange, Cross Street, Manchester M2 7BD (GB).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>
<p>(54) Title: PAPERMACHINE CLOTHING</p> <div data-bbox="334 1180 1354 1497"> </div> <p>(57) Abstract</p> <p>Papermachine clothing comprises a base fabric comprising at least two superimposed perforated non-woven membranes (11, 12), the upper or paper side one of which (11), has a lower maximum creep modulus and is less hard than the lower or machine side membrane (12).</p>		

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PAPER MACHINE CLOTHING

This invention relates to papermachine clothing, particularly, but not exclusively to clothing for use in the press section of a papermaking machine.

5 WO 92/17643 discloses papermachine clothing of the kind for use in the press sections of a papermaking machine which includes a base fabric composed of superimposed layers of synthetic thermoplastics material in mesh form which are secured together. The superimposed layers have apertures of different respective sizes and the base fabric formed by the
10 superimposed layers provides support and reinforcement to a fibrous batt. The lower (machine contacting) layer may have a coarser mesh than the upper (batt contacting) layer.

It has been found that when resilient membranes are used, as at present, in such structures, the flexibility of the material under the pressures
15 exerted in press nip causes the membrane material to deform and thus reduce or even close the mesh apertures. This in turn creates problems with re-wetting of the paper web with water which has entered the mesh being squeezed back through the batt into paper from which it has previously been extracted.

20 An object of the invention is to provide papermachine clothing with improved dimensional stability and strength, whereby the tendency towards

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closure of mesh apertures under nip pressure is much reduced and re-wetting, and marking, of the paper web alleviated.

In accordance with the invention, papermachine clothing includes a base fabric comprised of at least two superposed membrane layers of synthetic thermoplastics material in mesh form, characterised in that the
5 lower (machine side) membrane layer consists of a harder material than the upper (paper side) membrane layer which has a lower maximum creep modulus than the lower membrane layer.

Preferably, said upper membrane layer is of a thermoplastic polyurethane matrix material, with a Shore A hardness of, for example,
10 between 65 and 85. The lower membrane preferably comprises a polyamide matrix material with a Shore D hardness of, for example, between 40 and 45.

A sandwich layer of batt staple fibre may be provided between the
15 membrane layers.

The base fabric will normally in use support a fibrous batt of known form and materials, for example as described in WO 92/17643.

The effect of using a very hard lower membrane as envisaged is to create a large number of pockets into which water expelled from the paper
20 sheet can be accepted. This can significantly increase the dewatering capacity of the felt.

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The base fabric may of course be composed of three or more superimposed layers of perforated membrane and these may increase in hardness from the uppermost to the lowermost layer and similarly the sizes of the apertures may increase from the uppermost to the lowermost layer.

5 Preferably at least one membrane layer contains parallel reinforcing yarns extending in at least one direction, and the fabric may comprise two such layers. These membranes may be made in accordance with GB-A-2254288. The base fabric may contain one or more woven base cloth layers either between or on an outer face of the membrane layers.

10 Embodiments of the invention will now be described by way of example only, with reference to the accompanying drawings, wherein:-

Fig. 1 is a cross-section of a first embodiment of papermachine clothing according to the invention;

15 Fig. 2 is a cross-section of a second embodiment of papermachine clothing according to the invention; and

Fig. 3 is a cross-section of a third embodiment of papermachine clothing according to the invention.

Referring first to Fig. 1, a first embodiment of papermachine clothing
20 according to the invention comprises a fibrous batt 10 of known type supported by a base fabric which is composed of two superimposed

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membrane layers, an upper layer 11 and a lower layer 12.

The upper layer 11 is of a thermoplastic matrix material such as a thermoplastic elastomer, e.g. thermoplastic polyurethane with a Shore A hardness of from 65-85. The layer 11 is in the form of a mesh grid having substantially square or rectangular apertures 13 defined between machine direction lands 14 and cross machine direction strips not shown. In accordance with the teaching of WO 92/17643, at least some of the machine direction lands 14 are reinforced with load bearing yarns 15 embedded in and extending along the lands 14.

The lower layer 12 is secured to the upper layer 11 by thermal fusion of the abutting surfaces, or by means of an appropriate adhesive or by ultrasonic welding or needling. The lower layer 12 is of a thermoplastic material, e.g. a polyester, silicone or nylon such as PA6, PA6.6 or PA6.10 or a blend containing one or more of these. This material has a Shore D hardness of 40-45. The Shore D scale is used for this as the values available on the Shore A scale do not go high enough to provide a range for the layer 12.

Layer 12 is similar in configuration to layer 11 and also comprises square or rectangular apertures 16 defined by machine direction lands 17 and cross machine direction lands (not shown) to produce a similar mesh or reticulate structure. However, the apertures 16 are longer in size than the

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apertures 13 in the upper layer 11.

By way of example, the layer 11 may be from 0.75-1.25 mm in thickness, the apertures 13 have an individual means area of from 0.6-1.2 mm² and a pitch (centre to centre spacing of the apertures 13) of from 1.25 to 1.75 mm. The corresponding dimensions of the lower layer 12 are:-
5 thickness in the range 0.5-1.0 mm, mesh apertures 16 mean area from 1.2-1.8 mm² and pitch in the range of 1.75 mm-2.25 mm. In other words, the lower layer is much harder than the upper layer, somewhat thinner, with larger more widely spaced apertures.

10 Fig. 2 is a variant of Fig. 1 wherein an upper layer 21 is separated from a lower layer 22 by a batt layer 23. The upper and lower layers have similar dimensions to layers 11 and 12 in Fig. 1 and their properties and materials are also the same as or similar to those respective layers 11, 12. The batt layer 23 is needled into the lower membrane layers 22 and then
15 the upper membrane layer 21 is placed on top of the batt layer and the entire structure is needled together to effect a bond between the layers.

In Fig. 3 is shown a further variant, wherein papermachine clothing comprises an upper batt layer 30, supported by a base fabric comprised of three superimposed layers 31, 32, 33. Upper layer 31 and lower layer 33
20 have the same or similar properties and materials to those of layers 11 and 12 respectively of Fig. 1. Intermediate layer has hardness and dimensional

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properties which are intermediate between those of layers 31 and 33. This may be achieved by choosing an appropriate plastics material such as a polyamide/polyurethane blend or a less plasticised polyurethane.

Flexibility may be determined by meaning the converse, i.e. stiffness
5 as defined by maximum creep modulus. This is measured at 120°C and under 0.13 MPa applied load. The creep modulus of the softer layers 11, 21, 31 in the above embodiments may be in the range 2-10 MPa, and the harder layers 12, 22, 33 may be in the layer 15-25 MPa. The intermediate layer 32 of Fig. 3 may have an intermediate value of e.g. 8-16MPa.

10 The above embodiments are described by way of example only and the invention includes a variety of other embodiments within its scope. For example, any suitable combination of relatively resilient and relatively hard materials may be used, including metals for the hard membrane and natural or synthetic rubber as well as other plastics.

15 Any form of mesh of perforated sheet or foraminous structure may be used with any desired shape of aperture, including honeycomb structures and sheets with circular apertures, metal or plastics wire grids and meshes and the like.

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CLAIMS

1. Papermachine clothing including a base fabric comprising at least two superposed membrane layers of material in mesh form, characterised in that the lower (machine side) membrane layer consists of a harder material than the upper (paper side) membrane layer, which has a lower maximum creep modulus than the lower membrane layer.
2. Papermachine clothing according to claim 1, wherein said membrane layers are perforated.
3. Papermachine clothing according to claim 1 or 2, wherein said upper membrane layer is of a thermoplastic polyurethane matrix material.
4. Papermachine clothing according to claim 3, wherein said thermoplastic polyurethane matrix material has a Shore A hardness of between 65 and 85.
5. Papermachine clothing according to any preceding claim, wherein said lower membrane comprises a polyamide matrix material with a Shore D hardness of between 40 and 45.
6. Papermachine clothing according to any preceding claim, wherein a sandwich layer of batt staple fibre is provided between the membrane layers.
7. Papermachine clothing according to any preceding claim, comprising three or more superimposed layers of perforated membrane, said layers

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being arranged in order of increasing maximum creep modulus from the uppermost layer to the lowermost layer.

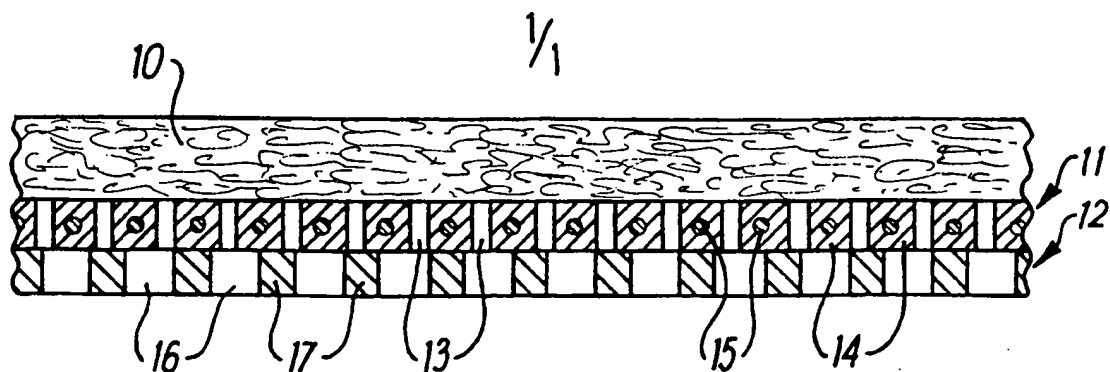
8. Papermachine clothing according to any preceding claim, wherein at least one of said membrane layers comprises parallel reinforcing yarns
5 extending in at least one direction.

9. Papermachine clothing according to any preceding claim, wherein said base fabric supports a fibrous batt layer.

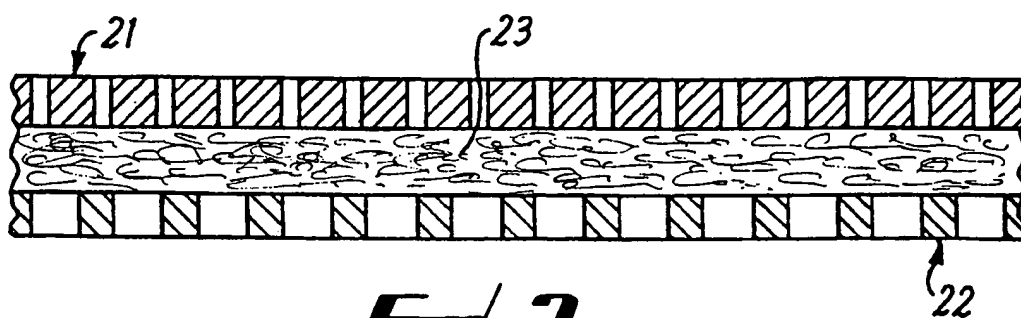
10. Papermachine clothing according to any preceding claim, wherein the base fabric includes one or more woven layers between or on an outer face
10 of the membrane layers.

11. Papermachine clothing according to any preceding claim, wherein the harder, membrane layer of higher maximum creep modulus comprises a mesh or perforated member having apertures or perforations of larger size and more widely spaced than corresponding apertures in the upper softer
15 membrane layer of lower maximum creep modulus which is also a mesh or perforated member.

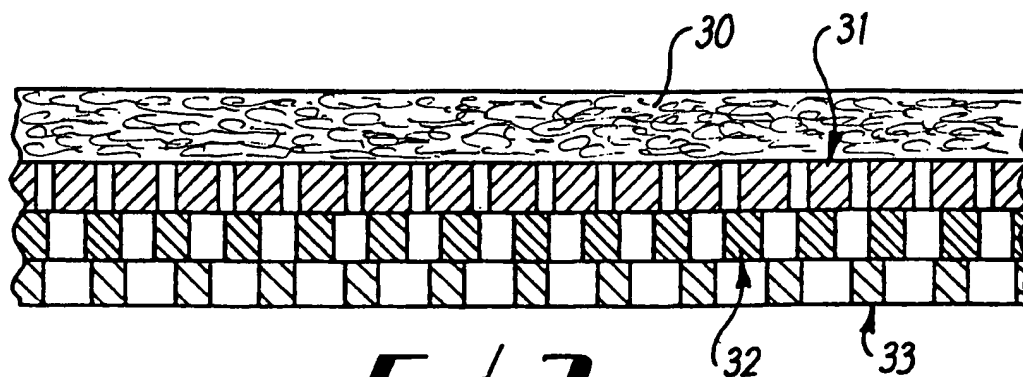
12. Papermachine clothing according to claim 1, wherein the softer membrane layer has a maximum creep modulus of from 2-10 MPa, and the harder membrane layer has a maximum creep modulus of from 15-25 MPa.



Fr. 1



FrE.2



FTE.3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 98/01544

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D21F1/00 D21F7/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 541 895 A (ALBERT HANS) 17 September 1985 see the whole document ---	1-3,5-11
A	WO 92 17643 A (SCAPA GROUP PLC) 15 October 1992 cited in the application see the whole document ---	1-3,6, 10,11
A	US 4 482 430 A (MAJANIEMI PEKKA) 13 November 1984 see column 4, line 27 - column 4, line 33 ---	1
A	EP 0 576 115 A (ALBANY INT CORP) 29 December 1993 -----	1,4,5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

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Date of mailing of the international search report

21/10/1998

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Information on patent family members

In tional Application No

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